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ABSTRACT

In October 1978, the National Science Foundation (NSF) initiated five studies of the continuing education of scientists and engineers employed in small, geographically dispersed industry. Following the award of these studies NSF requested Battelle, one of the award recipients, to assist in coordinating the five projects. This report briefly describes: (1) the objectives and scope of and the rationale for the coordination effort (to maintain and promote communication between directors of the respective projects and to promote agreement on common definitions or other issues affecting the general area of continuing education under consideration); (2) the five awarded studies; (3) the coordination activities; and (4) conclusions and recommendations regarding future work in the area. It was suggested that, in future endeavors, NSF utilize the "standardization of methodology" approach or "technical direction" approach in lieu of mere coordination of issues and definitions, since either approach would likely result in greater comparability of results. Included in appendices are the coordination agreement with Battelle, documents related to establishing the coordination meeting, topics for discussion, press release, Battelle's survey instruments, and a bibliography in the area of continuing education. (Author/SK)

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Battelle
Columbus Laboratories

Report

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COORDINATION OF NSF PROJECTS IN THE AREA OF CONTINUING EDUCATION FOR SCIENTISTS AND ENGINEERS

by [SED81-09985]

Lawrence G. Welling

November, 1981

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COORDINATION OF NSF PROJECTS IN THE AREA OF CONTINUING EDUCATION FOR SCIENTISTS AND ENGINEERS

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INTRODUCTION

For many years, the continuing education of scientists and engineers has been of significant interest to the National Science Foundation (NSF). This interest by NSF anticipated a growing concern that the United States is declining, technologically, when compared to other industrialized countries. A corollary concern is that, as a result of rapid technological change, technical obsolescence of scientists and engineers is increasing. It has been estimated that the half-life of the current engineering graduate's technical information is only seven years, if his/her training is not updated. Additionally, technological advancement can lead to the emergence of new occupational skill areas. Availability of continuing education opportunities could help experts from related disciplines move into these new occupational areas more readily.

In view of these concerns, NSF funded several studies in the area of continuing education for scientists and engineers. In 1968-69 Renck, et al., studied continuing education for R&D careers*. In June, 1975, NSF initiated planning for two studies, one concerning the continuing education of engineers and scientists provided by universities and

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* Renck, R., Kahn, E. L., and Gardner, B. B., Continuing Education for R&D Careers, NSF 69-20, National Science Foundation, Washington, D.C., 1969.

colleges*, the other concerning continuing education for nonacademic scientists and engineers provided by industry**. Conduct of the second study was funded by NSF in September, 1977. This study, by Levy and Newman, primarily involved large, urban establishments, i.e., the majority of the establishments surveyed had 500 or more total employees and were located in Standard Metropolitan Statistical Areas (SMSAs).

In October, 1978 NSF initiated five studies of the continuing education of scientists and engineers employed in small, geographically dispersed industry. The rationale for these studies was that small, geographically dispersed companies experience unique problems in attempting to meet the continuing education needs of their scientific and engineering personnel. Traditional sources of scientific and engineering continuing education, e.g., universities and colleges, technical societies, and itinerent fee-paid seminars, are largely urban based. They are, therefore, not readily accessible to scientists and engineers employed in small firms located in relatively rural areas. Other problems include staff-size limitations which negate the "mass" required for an organized in-house technical staff education program and budget.

The five studies of the continuing education needs of scientists and engineers in small, non-urban companies which were initiated were:

- Welling, L. G., Levy, G. W., and Newman, S. C., Survey of Continuing Education Delivery Systems for Scientists and Engineers Employed in Small, Non-Urban Establishments. Battelle Columbus Laboratories, Columbus, Ohio, 1980.
- Amos, J. M., Babcock, D. L., Burk, F., Maule, C. S., Continuing Education Needs of Engineers/Scientists in the Three-State Ozark Region. University of Missouri - Rolla, Rolla, Missouri, 1980.

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* Klus, J. P., and Jones, J. A., Survey of Continuing Education for Engineers and Scientists, American Society for Engineering Education, Washington, D.C., 1978.

** Levy, G.W., and Newman, S.C., A Survey of continuing education for Nonacademic Scientists and Engineers. Battelle Columbus Laboratories, Columbus, Ohio, 1979.

- Adams, W. S., Assessment of Scientists'/Engineers' Continuing Education Needs in Small, Geographically Dispersed Industries. University of Wisconsin-Oshkosh, Oshkosh, Wisconsin, 1980.
- Zemp, J. W., and Hamill, M. J., A Model Continuing Education Needs Assessment/Response System in Science and Engineering. Charleston Higher Education Consortium, Charleston, South Carolina, 1981.
- Harrell, D., Continuing Education for Scientists and Engineers: Delivery Systems in North Carolina. North Carolina State University, Raleigh, North Carolina*.

Following the award of these five studies, NSF requested Battelle, one of the award recipients, to assist in coordinating the five projects (see Appendix A). Battelle was selected primarily because its study was national in scope, whereas the other four studies were of a local or regional scope. This report briefly describes: the objectives and scope of, and the rationale for, coordination; the five studies; the coordination activities; and, conclusions and recommendations regarding future work in the area.

OBJECTIVES, SCOPE AND RATIONALE

The objectives of the coordination activity were:

- To maintain and promote communication between the directors of the respective studies, and
- To promote agreement on common definitions and terminology or other issues affecting the general area of continuing education being studied.

Specifically excluded from the purview of the coordination activity was: any modification of the scope of the five research proposals, as approved by NSF; any control by Battelle over the content and procedures of the four university based research programs; or, monitoring of the actual conduct of the four university studies.

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* The study by Daniel Harrell had not been completed at the time this report on coordination activities was written.

The rationale for coordination of the five projects was founded on several NSF concerns. The primary concern was the desire to make the results of the five studies as comparable as possible to each other, as well as to those of the studies of Levy and Newman, and Klus and Jones. A secondary concern was to facilitate the conduct of each of the five studies by promoting a free exchange of information on issues such as: study objectives, study methodology, bibliographic resources, survey items, and questionnaire design. A further concern was to provide an available resource (i.e., Battelle) for critical issues and information needs related to research methodology, in view of the "applied" or "service" orientation of the university projects and staff. Additionally, NSF was concerned that initial press releases on the five projects be coordinated in order to lessen possible confusion regarding the nature and scope of the projects and their relationship to one another. This was deemed important since the five projects, though different in objectives and scope, were all in the same basic subject area and many had similar titles.

With respect to the primary concern of comparability of results, issues such as standardization of definitions and terminology used in the studies, analysis and reporting of results for maximum comparability, and cooperation on certain follow-on activities, such as preparation of a monograph on the five studies, were to be addressed.

NSF FUNDED STUDIES

The five studies of continuing education in small, geographically dispersed industry are briefly described in the following sections*.

Survey of Continuing Education Delivery Systems for Scientists and Engineers Employed in Small, Non-Urban Establishments**

The purpose of this study was to define the unique problems of small, non-urban establishments in providing continuing education for their

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* This section includes material which is quoted directly from the reports or proposals on the five studies.

** Welling, L. G., Levy, G. W., and Newman, S. C., Survey of Continuing Education Delivery Systems for Scientists and Engineers Employed in Small, Non-Urban Establishments. Battelle Columbus Laboratories, Columbus, Ohio, 1980.

scientists and engineers. The survey methodology involved collecting data through a mail survey of establishments with 500 or fewer employees that were located in non-metropolitan counties that had no college or university located in the county. Before the mail survey was conducted, telephone screening calls were made to 910 small establishments in 100 randomly selected non-metropolitan counties throughout the continental United States. Based on the results of these telephone calls, questionnaires were sent to 301 small establishments, of which 156 (52 percent) responded. Information was sought regarding characteristics of the establishment, available education delivery systems, company support of continuing education, sources used in determining continuing education needs, reasons for supporting continuing education, education expenditures and participation, types of support, perceived effectiveness of continuing education, and employee objectives in participation.

The respondent establishments can be described as predominantly working in the durable good-manufacturing sector of industry, and locally owned and operated. Specifically, 64 percent of the respondent establishments were engaged in the manufacturing of durable goods, 11 percent were engaged in the manufacturing of nondurable goods and 25 percent provided business or miscellaneous services. It was also found that 78 percent of these establishments were locally-owned, single-site establishments and 22 percent were multi-site establishments.

The establishments that took part in the survey had to have 500 or fewer employees to qualify for inclusion, but in most cases they had a great deal fewer than that. The median reported number of employees (both full and part-time) in respondent establishments was 15.5 employees. The median reported number of scientists and engineers was 1.7. Approximately 50 percent of the establishments had only one scientist or engineer. The median percentage of scientists or engineers to all employees was 10 percent.

Many small, non-urban establishments do not have facilities on-site or do not provide support for continuing education activities. Support for continuing education could have been for tuition/registration, instructional materials, travel costs and/or professional time. Specifically,

37 percent of the surveyed establishments do *not* have any facilities on-site that could be used to support continuing education, and only 55 percent support continuing education activities. (This 55 percent of support for continuing education can be compared to 83 percent support among large, urban establishments.) The primary reason establishments gave for supporting continuing education was that they believe it increases employee productivity.

By design, the surveyed establishments could not be in the same county as an institution of higher education. In fact, 41 percent of the establishments were located at least 50 miles from the closest college or university. This distance is large enough that it would seriously restrict most employees from participating in courses at the institutions, even if appropriate courses were offered. Cooperation with other local establishments is another method of providing continuing education. Unfortunately, the survey found that 35 percent would not be willing to cooperate with other local establishments to support continuing education activities. This willingness to cooperate would make it difficult to share facilities and aggregate a market to import continuing education into an area.

In addition to information on establishments, survey data was also collected from 218 scientists and engineers who were employed by the surveyed establishments, with not more than 10 from any one firm. The median age of the respondents was 33.5 years and the median years employed as a scientist or engineer was 8.9 years. Over three-quarters of the sample both worked in and had their highest degree in engineering. A comparison of the respondent scientists and engineers to a national sample shows that there are fewer advanced degrees among scientists and engineers in small geographically remote companies than in the national sample (10 percent for a masters degree and 3 percent for a doctorate in the small companies, compared to 21 percent and 11 percent, respectively, in the national sample).

Formalized continuing education activities were participated in by 35 percent of the respondents within the last year and by a total of 58 percent in the last three years. These same respondents indicated that

non-credit courses and brief educational activities conducted away from the establishments were the most effective types of continuing technical education. The primary objectives for participating were: "to perform present job assignments better", "to keep from becoming obsolete", "for intellectual stimulation" and "to prepare for increased responsibility".

Establishments contribute more funds than do employees for continuing education activities, but employees use more of their own time than company supported time. The respondents reported that a median of $501 was spent on their continuing education activities during 1978. (The median establishment contribution was $351 and the median employee contribution was $39.) The time spent on continuing education activities was 30 hours of company time and 36 hours of personal time during 1978.

The primary reason given for not participating in continuing education was that the physical distances were prohibitive. The median distances that scientists and engineers would be willing to travel were approximately: 200 miles to attend a workshop/seminar/conference of at least one day with an overnight stay; 100 miles for a workshop/seminar/conference with no overnight stay; 50 miles for a course that meets once a week; 30 miles for a course that meets twice a week; and 25 miles for a course that meets more than twice a week. Another important reason given for not participating in continuing education - that the needed courses were not offered, or were not conveniently offered - is also related to the geographical remoteness of these individuals. The third most frequently mentioned reason for not participating was that other personal commitments were more important.

Besides formalized continuing education activities, updating can also be achieved through professional activities. Unfortunately, more than half of those surveyed had *not* attended a professional association meeting within the previous year, and 44 percent did *not* regularly contact colleagues in other organizations. However, 41 percent of these scientists and engineers reported regularly reading three or more scientific and engineering periodicals.

Due primarily to geographical location, scientists and engineers in small, single-site, non-urban establishments appear to have inadequate means of fulfilling their continuing education needs. Traditional delivery systems are not getting the job done, therefore, systems which are unaffected by geographical remoteness from colleges and universities are needed. Also needed is an additional source of support for continuing education. This additional support is needed because, in comparison with large urban establishments, relatively few scientists and engineers in small non-urban establishments receive continuing education support from their employers. However, it is possible that this support might be forthcoming if continuing education was made readily available through new delivery systems.

Continuing Education Needs of Engineers/Scientists in the Three-State Ozark Region*

This study was designed to assess the needs for continuing education in non-metropolitan areas and the perceived effectiveness of alternative methods of meeting these needs from the viewpoints of both the engineers/scientists and their employers. The characteristics investigated were motivation for education, delivery systems, subject matter content, and willingness to pay.

The topographic area chosen for the study was the Ozark Region which consists of southern Missouri, northern Arkansas, and eastern Oklahoma. Metropolitan areas within this region having populations larger than 150,000 were excluded. An engineering school in each of these states participated in the study. They were the University of Arkansas (Fayetteville), the University of Missouri-Rolla (Rolla), and the Oklahoma State University (Stillwater).

Engineering/scientist respondents were selected in different ways in each state. Missouri surveyed its own alumni, whose professional experience averaged approximately 12 years since the receipt of their baccalaureate degrees. Oklahoma surveyed lists of registered professional engineers (average experience of about 22 years since the receipt of the

* Amos, J. M., Babcock, D. L., Burk, F., Maule, C. S., Continuing Education Needs of Engineers/Scientists in the Three-State Ozark Region. University of Missouri - Rolla, Rolla, Missouri, 1980.

baccalaureate), and Arkansas used an existing list of professional society members and symposium attendees (an average of about 17 years since receipt of the baccalaureate, including some with less than a baccalaureate degree). Of those with baccalaureate degrees, 19 percent held master's degrees and 3 percent doctoral degrees. The respondents had been with their current employers for almost two-thirds of their professional careers. Half of the engineers with five years or less experience supervised technicians and nontechnical people. About 80 percent of the more experienced engineers indicated that as they became older, the number and education of those supervised increased.

Employers were also selected differently by the three states. Missouri and Oklahoma used Directories of Manufacturing, but Missouri excluded firms with under 50 employees. Oklahoma excluded plants with over 500 employees. Arkansas used lists of employers of professional society members and symposium attendees without regard to the size of the companies. Apparent differences in the results proved on analysis to be a function of the different selection methods employed.

Employers with small staffs were more likely to be independent, single-location plants. The ones with large staffs were more likely to be subsidiaries of large organizations, and these employed a high ratio of engineers to technicians. The 216 employers responding to the study employed a total of 850 engineers/scientists. Thirty-three of these employers (16%), who had no less than seven engineers/scientists on their individual staffs, employed 595 (70%) of the 850. This suggests that in continuing education strategy, emphasis should be placed on employers of significant numbers of engineers/scientists, because such employers are more likely to have facilities and equipment available for continuing education use and to have a higher regard for it than employers of few engineers/scientists.

In the study, both employers and individuals were asked about the influence of continuing education and the motivations for supporting it or seeking it. Both groups agreed that it had little influence on bonuses and only slightly more on pay raises, thus suggesting that these

factors are poor selling points for continuing education. Larger companies and their employees recognized a moderate effect on promotions. Both groups agreed that "acquiring new skills", "increased efficiency", and (except for governmental employers) "company expansion" were important reasons for employer support of continuing education. Other favorable reasons, such as to "acquire new technical information", "perform present job better", and "prepare for increased responsibility" were selected as primary motivations by individual respondents.

Financially, employers were more willing to support non-credit continuing education programs, and engineers/scientists (especially the young ones) were more willing to finance credit courses. Employers (especially the large ones) usually reimbursed their employees for tuition and fee expenses and often paid for their books and materials, but payment for travel and provision for released time was common only for non-credit programs. Differences by state, size of employer, and experience of engineers/scientists were minor.

As for educational methods, both employers and individuals preferred "lecture-discussion" to either "primarily lecture" or "primarily class participation". Where the location could not justify a "live" instructor, both groups felt that either closed-circuit TV or TV tape was moderately effective. They were ambivalent about programmed learning, audio cassettes, and correspondence courses; and they disliked telephone conferences.

Both employers and individuals considered it reasonable to travel about 40 miles one way to attend credit courses. For non-credit programs, employers of seven or more engineers accepted much longer one-way distances (342 miles) than those who employ one to six engineers (160 miles) or are governmental units (70 miles). The Oklahoma engineers were less willing to travel (125 miles) than the others (173 miles). As for scheduling, both groups preferred continuing education in three-hour evening sessions to weekend or multi-day programs, although the common two or three-day seminar was also well accepted for non-credit programs.

Assessment of Scientists'/Engineers' Continuing Education Needs in Small, Geographically-Dispersed Industries*

To assess the continuing education needs of scientists and engineers employed in small geographically dispersed industries, thirty companies in central and northern Wisconsin were visited during 1978-79. The respondents in the study consisted of 30 company presidents or their representatives, 116 top managers and 192 middle managers, all of who had responsibilities for science and engineering. Many did not have degrees in science or engineering. The data incidate that most middle managers earned their supervisory position through on-the-job training and continuing education. Chief executive officers of many of the companies interviewed said that their firms could not afford to employ degreed engineers and that the individuals currently employed in engineering-type jobs were performing more than satisfactorily.

The principle types of work scientists and engineers in these companies were engaged in were mechanical engineering, design, and industrial engineering. It was also noted that almost a fifth of these technical people were performing research and development tasks. This finding may be unexpected in small firms. Other interesting facts were that over 40 percent of the scientists and engineers have been in their technical positions less than ten years; over three-quarters of middle managers read a technical journal regularly; and over half consult with colleagues in other organizations on a regular basis.

Besides in-service programs (on-the-job training), industrial personnel made a great deal of use of continuing education offered by manufacturers of equipment used by the company and by professional and trade associations. Participation in continuing education provided by educational institutions was less than half that delivered by non-educational institutions.

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* Adams, W. S., Assessment of Scientists'/Engineers' Continuing Education Needs in Small, Geographically-Dispersed Industries. University of Wisconsin-Oshkosh, Oshkosh, Wisconsin, 1980.

Central and northern Wisconsin appear to have a smaller proportion of that state's continuing education opportunities. The opportunities they do have are: 43 degrees within the University of Wisconsin 4-year campuses in applied science and engineering; 198 diplomas and associate degrees within the Vocational Technical and Adult Education Systems in trade and industry; and 37 programs within Wisconsin's independent colleges and universities in applied science and engineering.

Industrial executives and scientists and engineers did not say they were disappointed with the access to continuing education. Most respondents thought opportunities for continuing education were accessible, t the location of these activities was often seen as a problem. The most frequently preferred institutions to deliver continuing education were the University of Wisconsin (4-year) System and the VTAE (2-year) System. The preference of the people interviewed within industry was that continuing education courses be located geographically close to the industries themselves, rather than at the institutions, which are often located at distances that make it impractical to commute to on a frequent basis.

The respondents wanted more personal development and business administration courses than were available. Most of the companies interviewed trained their employees in basic technical areas, but they did not have and could not affort to employ experts in the human services areas.

Evidence of the increased interest in post-secondary education was the stated desire to have more college credit and non-credit courses available. While seminar, conference and workshop formats are still the most popular way to deliver continuing education, a large number of managers wanted the traditional college courses expanded so that the colleges would take a larger share of the continuing education responsibility. Not surprisingly, respondents felt in-service training courses were the most effective while correspondence courses were the least effective. Seminars, conferences and workshops were also rated high on effectiveness, whereas college credit courses were not given high ratings. Scheduling these activities did not seem to be much of a problem, although some respondents suggested more evening classes were needed.

Industry viewed continuing education as very important. The main reason for this continuing education support was because managers see it as a means for keeping their employees current in technology and up-to-date on trends in the market place. Employees felt continuing education was primarily important to perform their jobs better and to prepare them for increased responsibility.

Company managers did not view motivation as a problem for employee participation in continuing education regardless of whether or not the company has a reward system for such activity. Most of the small industries did not have a formal continuing education policy. Their means of rewarding employee continuing education involvement was primarily through recording it in the personnel files.

When it came to reimbursing employee expenses for continuing education, company priorities were: (1) seminars, conferences and workshops (where all expenses were paid), (2) non-credit instruction (where most, but not all, expenses were paid), (3) credit courses (which were paid about at the same level as non-credit instruction), and (4) organized self-study, e.g., correspondence courses (where only partial financial support was given to the employee). Companies were willing to pay for employee growth and development when they were convinced their dollars would be well spent.

The average annual expenditure for company employee continuing education activities increased from $900 to $2,333 over the period of the study, 1976-80. Few employees participated in continuing education at their own expense. This probably means that to increase employee involvement in continuing education, companies will need to financially back these activities. Small industries tended not to own permanent property to deliver continuing education in their own plants. On the average they spent $300 a year on equipment and about $700 a year on educational materials.

The message is clear from these representative small industries in central and northern Wisconsin. They believe in continuing education and judge it to be important to their companies, and they would like to have post-secondary educational institutions provide more of it at locations close to where they live and work.

Continuing Education Needs Assessment/Response System in Science and Engineering*

The objective of this study was to develop a model system of local needs assessment and follow-through responses in the area of continuing education for industrial scientists and engineers. The grantee was a consortium of five colleges known as the Charleston Higher Education Consortium (CHEC). The member organizations of CHEC include all of the post-secondary institutions in the tricounty region: the Baptist College at Charleston, The Citadel, the College of Charleston, the Medical University of South Carolina, Trident Technical College, and the Marine Resources Division of the South Carolina Wildlife and Marine Resources Department. (The Marine Resources Division is not an educational institution, but does contribute faculty and research resources to various CHEC programs.)

The needs assessment system was tested in the tricounty Charleston SMSA, a 2,600 square mile area containing a number of small-to-medium sized (up to 1,600 employees) industries employing engineers and scientists.

The consortium planned its NSF project as a means of answering the need to improve the local capacity of educational providers (particularly colleges and universities) and industries to conduct reliable assessments of the continuing education needs of industrial scientists and engineers, and to design appropriate follow-through responses. The project proposed to answer this need by devising, testing and disseminating a multi-college, multi-industry system that would offer a model of comprehensive needs assessment and coordinated follow-through procedures.

In order to document these needs and to find out if such a model system had already been devised and publicized, the Consortium requested that an ERIC literature search be performed by the S. C. Department of

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* Zemp, J. W., and Hamill, M. J., A Model Continuing Education Needs Assessment/Response System in Science and Engineering. Charleston Higher Education Consortium, Charleston, South Carolina, 1981.

Education's Education Products Center. The majority of the books, monograph's, and articles that the search yielded described innovative programs and delivery systems. None of the authors offered a model of local needs assessments. Several, however, emphasized the important role that local needs assessments play in the utilization of continuing education programs (whether national, regional, or local, in scope). Some went further, and noted the inherent problems in conducting systematic, reliable needs assessments at the local level, particularly in localities characterized by either a small number or a diversity of industries employing neither a great number nor homogeneity of scientists and engineers.

For the study, the Consortium conducted and analyzed the results of three surveys of the continuing education needs of engineers, chemists, and laboratory and engineering technicians employed by industries in Berkeley, Charleston and Dorchester Counties. These surveys were: (1) an "Initial Management Survey", which was completed by management representatives from 25 industries; (2) a "Follow-Up Management Interview", which was conducted with representatives from 5 of the participating industries; and (3) an "Employee Survey", which was completed by 296 employees of 10 of the participating companies.

Recommendations were formulated during two meetings of the project's Advisory Committee. These included:

1. That the colleges and industries should continue their joint needs assessment and planning mechanisms and activities (e.g., as exemplified by The College of Charleston's Advisory Committee for chemistry).
2. That the colleges need to make sure that their planning is responsive to both employer-perceived and employee-perceived needs. (The Management and Employee Surveys showed several potentially significant discrepancies between the two groups -- e.g., whereas 19 out of the 25 managers said that their company's continuing education needs are being well met, 190 out of the 289 responding employees felt that their needs are being marginally or poorly met. The two groups may, of course, have different needs; and colleges need to meet the needs of <u>both</u>.)

3. That the colleges need to offer more courses and programs with the following characteristics: "special topics" that are responsive to employer and/or employee demands; "compressed time" schedules; use of industrial employees as instructors.
4. That the colleges need to publicize better their current and planned program and course offerings.
5. That the College of Charleston, in cooperation with the Consortium, should continue its preliminary planning towards an M.S. in chemistry.
6. That The Citadel should continue its cooperation with Clemson University and the University of South Carolina in their offering of M.S. programs in engineering and should continue its planning towards offering specialized engineering courses (e.g., in microprocessors).
7. That in their efforts to enact the above recommendations, the colleges need to identify and work with more individuals (both managers and non-managers from tricounty industries.

Continuing Education for Scientists and Engineers: Delivery Systems in North Carolina*

The Industrial Extension Service, School of Engineering, North Carolina State University, is conducting** a study of continuing education (CE) delivery systems in North Carolina. The principal objectives of the study are:

-- To identify and describe continuing education resources currently being utilized by scientists and engineers to maintain and extend their professional competence and capabilities.

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* Harrell, D., Continuing Education for Scientists and Engineers: Delivery Systems in North Carolina. North Carolina State University, Raleigh, North Carolina.

** As noted previously, this study had not been completed at the time this report on coordination activities was written.

-- To determine the extent of use and the perceived effectiveness of these educational resources in meeting the CE needs of scientists and engineers.

-- To identify deficit CE needs of scientists and engineers and the preferred delivery systems.

In particular, by focusing on scientists and engineers in North Carolina, the study is intended to yield important data and information regarding the delivery of CE programs to employees of relatively small, geographically-dispersed companies.

The completed study will provide guidelines for those engaged in developing and delivering CE programs for scientists and engineers. These guidelines, in turn, should benefit the individual scientist or engineer, his/her employer, and society.

To achieve the objectives of this study, it was proposed that a survey instrument be developed, that it be field tested and refined as necessary and then be used in surveying a random sample of the 30,000 scientists and engineers in North Carolina. Information to be obtained by the survey instrument includes:

1. Formal education
2. Field of work
3. Age
4. The importance of CE to professional development
5. How current he/she considers himself/herself to be
6. Motivations for CE
7. What methods of CE delivery have been used in the last three years
8. Preferred methods of delivery of CE
9. Unmet CE needs
10. Attitudes of supervisor and employer toward CE
11. Total time spent per month on CE

COORDINATION ACTIVITIES

The following activities were pursued in meeting the objectives of the coordination effort.

Initial Coordination Meeting

A meeting of the five project directors was scheduled and held at Battelle's Columbus Laboratories on November 12, 1978 (see Appendix B). Representatives of all five projects were in attendance, as was Girard W. Levy, principal author of the NSF study of continuing education of non-academic scientists and engineers and Eugene D'Amour from the National Science Foundation. Dr. D'Amour presented the goals and aspirations of the NSF with respect to the five projects, the general area of continuing education, and the coordination activity. Lawrence Welling, of Battelle, outlined the general goals of the coordination effort. Each project director briefly outlined the unique goals and objectives of his respective project.

Included in the working session discussion were topics such as: design and content of data collection instruments; sample selection; data collection procedures; data analysis; and reporting of the final results. With respect to the data collection instruments, data collection categories discussed included: the technical content of continuing education activities; motivation for participation in continuing education programs; personal and professional characteristics of the involved scientists and engineers; the perceived importance or effects of continuing education participation; and, characteristics of the employing companies and their support of continuing education. The need for separate employer and employee survey forms was also discussed (See Appendix C).

Sampling procedures discussed were related to the characteristics of the establishments and employees to be included in the five surveys, as well as to the procedures for selecting the sample of establishments and employees.

Discussion of data collection procedures included procedures for contacting the sample, conduct of pre-tests of the survey instruments, use of endorsement letters, offering of incentives for participation, and procedures for following up with non-respondents.

The discussion of data analysis and reporting focused on methods for insuring the greatest possibility of comparability of results among

the five studies and with the studies of Levy and Newman, and Klus and Jones. Also discussed were several specific types of analysis that would be of use to continuing education providers, to industry, and to individual scientists and engineers.

At the meeting, copies of a press release prepared by Battelle on the five studies was reviewed and approved by the project directors (See Appendix D). A photograph of the five project directors was taken to accompany the press release. Individual project directors agreed to withhold publicity on their individual projects until this release on all five studies had had an opportunity to appear in the technical and popular press.

Results of the Coordination Meeting

Conclusions and recommendations stemming from the November 21, 1978 coordination meeting of NSF Project Directors are reported as follows, in three major categories: (1) Definitions and parameters, (2) Project activities, and (3) Future coordination plans.

1. Definitions and Parameters

   1.1 Continuing Education

   1.1.1 Information on both "continuing education" (i.e., education or training which increases the individual's scientific or engineering competence) and "advanced education" (i.e., work toward an advanced degree) was subject for inclusion in data collection.

   1.1.2 The differences between "continuing education" and "tuition reimbursement" programs were discussed. It was agreed that both tuition reimbursement and continuing education programs could be focused on scientific/engineering *updating*. However, many tuition reimbursement programs are utilized for *upgrading*, where an individual is, in substance, changing scientific/engineering fields or changing his status in a scientific/engineering field (e.g., B.S. to M.S., M.S. to Ph.D.). *It was agreed that activities directed toward "upgrading" should, if possible, be analyzed and reported separately from activities directed toward "updating".*

1.1.3 Both credit and non-credit courses were to be included.

1.1.4 Most of the studies of small or dispersed industry were to focus on CE activities which further the employee's engineering and scientific knowledge and were *not* to include management* and/or personal development courses.

1.1.5 It was agreed, however, that those studies which proposed to collect data on management programs, as well as scientific/engineering programs, would continue to do so. These studies were to distinguish between scientific/engineering courses and management/support** courses during data collection and were to analyze and report the results according to these separate categories. In this way comparability of results between the studies and with other, national studies would be maintained.

1.2 Scientists and Engineers

1.2.1 The following definition of scientists and engineers was discussed:

*"Scientists and engineers are employees who hold at least a Bachelor's degree (or the equivalent)*** *in an engineering or scientific field and spend more than half of their time in the following job functions:*

research	*maintenance*
development	*planning*
testing & evaluation	*contract & grant administration*
design	*data collection*
construction	*providing or researching of scientific or technical information*
inspection	*enforcement of standards or regulations*
production	
installation	
operation	

Specifically excluded are scientists and engineers who spend more than half their time in management, sales, advertising, personnel work, teaching and training, or providing medical, psychological, or social services."

---

* It was agreed that, while management is a natural job progression for scientists and engineers, management courses do not enhance the scientific or technical competence of scientists and engineers since they do not build directly upon their basic scientific and engineering training.

** Examples of "support" courses may be: "Technical Writing", "Writing Research Reports", "Professional Speaking", etc.

*** It was agreed that "the equivalent" could be a state issued license to practice in the scientific or engineering field, or past experience.

It was agreed that studies which proposed to include technologists and/or technicians (including sub-baccalaureate degree personnel) would continue to do so, but that the results for scientists and engineers, as defined above, would be presented separately. This was to help assure that the results would be comparable to those of the national studies conducted by J. Klus and G. Levy.

It was further suggested that studies that proposed to include "management" personnel in their surveys continue to do so. A recommendation was made that results for this group of "management" scientists and engineers also be reported separately.

1.3 Small Industry

1.3.1 It was agreed that only industries or plants with fewer than 500 total personnel would be included in the study. No lower limit was specified.

1.3.2 Plants which are subsidiaries of large companies but which have fewer than 500 total personnel at the particular site would be included under the definition of small industry.

1.3.3 Small consulting firms (e.g., civil engineering, etc.) would be included under the definition of small industry. Although data from consulting firms were to be included, it was suggested that this data be reported separately since there may be few similarities between the continuing education needs of scientists and engineers working in the consulting field and those working in industry.

1.4 Geographically Dispersed Industry

1.4.1 Geographically dispersed industry was defined as: "Plants/companies which are located in non-SMSA counties which do not have a college or university offering a graduate degree in science or engineering." However, some of the studies would cover "market areas" that were in SMSAs.

1.4.2 It was agreed that scientific/engineering employees of local government (city, township, county) would be surveyed *only* by those studies which originally proposed to do so. These studies would report their data in a manner which allowed the results for scientists and engineers employed by small, dispersed industry to be distinguished from the results for scientists and engineers employed by local government.

1.5 Continuing Education Delivery Systems

1.5.1 It was agreed that questions regarding delivery systems used for continuing education should have a time period limitation of those used within *the last three years*.

1.5.2 Delivery system questions would be asked of both employers and employees.

1.5.3 Delivery system questions would be asked to obtain data on both the "actual" delivery system being used and on the "desired" delivery system.

2. Project Activities

2.1 Data Collection Categories*. The following data collection categories were discussed.

2.1.1 Technical contents of CE programs

2.1.2 Incentives (motivation) for participation in CE programs (employers/employees)

- Willingness to participate under certain circumstances

2.1.3 Personal characteristics

- Highest degree
- Field of work
- Number of years in field
- Age (range)
- Years since last degree
- Certification and/or licenses
- Professional organization membership (national, state, local)
- Extent to which prerequisites for graduate level courses have been obtained.

2.1.4 Type of CE delivery system used in last three years (employer/employee)

- *Actual* and *desired* CE delivery system

2.1.5 Importance of CE

- CE/productivity interface
- CE/retention interface

2.1.6 Perception of the individual's degree of obsolescence

2.1.7 Unmet CE needs

- Indicators of CE needs

2.1.8 CE time spent per month

2.1.9 Source of funds for CE

* This is not a comprehensive list of possible data collection categories.

2.2 Utilization of Study Results

2.2.1 It was recommended that project directors maintain awareness that the results of the studies could be utilized for several different purposes. These included but were not limited to:

- Design of CE curricula
- Development of CE delivery systems
- Industrial emphasis and funding of CE programs
- NSF policy development

Project directors were advised to collect data and report study results in such a manner that the broadest use could be made of the study results, even though a particular project might have a particular emphasis.

3. Future Coordination Plans

3.1 Meetings

3.1.1 No other special coordination meetings were planned at the time of the meeting

3.1.2 It was agreed that, if possible, the project directors for CE for small or dispersed industry would meet as a subgroup during the February 7-9, 1979, meeting of Science Education Development and Research (SEDR) project directors in Washington, D.C.

3.2 Information Exchange

3.2.1 Project directors were encouraged to send copies of all data collection items/instruments developed in their project directly to the other project directors for CE for small or dispersed industry

3.2.2 The exchange of references and reference materials was encouraged

3.2.3 Project directors were to endeavor to keep each other informed of methodological developments which may be of benefit to the other projects

In summary, it was agreed that project directors were not to depart from their proposals as approved by NSF. However, project directors were to collect their data and report their research results in such a way as to allow the maximum comparability between the respective studies and to the national studies of Klus and Jones, and Levy and Newman.

The results of the coordination meeting, presented above, were conveyed in a letter to the project directors and to NSF.

Meeting of Science Education Development and Research (SEDR) Project Directors

The National Science Foundation held a meeting of Science Education Development and Research (SEDR) project directors in Washington, D.C., February 7-9, 1979. During this meeting, Dr. Eugene D'Amour, NSF, chaired a session on the "Continuing Education of Scientists and Engineers". Representatives of the five projects examining the continuing education of scientists and engineers in small, geographically dispersed industry, made presentations on their respective projects.

Following the session on "continuing education", those project directors with time available met informally to discuss the coordination effort. During this meeting the issue of the distinct, but related, goals and objectives of the individual projects was again discussed, as well as the constraints that these goals placed upon mutuality of the results. It was suggested and resolved that the maximum comparability of results and benefit for the field of continuing education of scientists and engineers could be achieved through development of a monograph on the five projects and the studies of Levy and Newman and Klus and Jones. It was further agreed that, toward the completion of the five projects, Dr. Levy would submit a proposal to NSF on the topic of the monograph and direct the project, if funded. The four university project directors conducting continuing education studies in the area of small, dispersed industry would serve as subcontractors to Battelle. Each would contribute a chapter on the results of his respective project for the monograph, as would Lawrence Welling, John Klus and Girard Levy. They would also review the completed monograph, including chapters related to the comparison of results.

Subsequently, a preliminary proposal on the "monograph" was written and submitted to NSF on July 17, 1980. The key activities outlined in this proposal were:

1. Battelle would prepare an outline for the monograph listing proposed chapters. A brief description of each chapter would specify topics,

variables, or items of information to be presented in each chapter (e.g., extent of continuing education activities in industry, effect of company characteristics on support, effect of personal characteristics on continuing education participation, incentives, delivery mecahnisms, etc.). It was noted that *each chapter would not be a summary of a project, but rather would synthesize and interpret across the studies, comparing the findings with the national studies when applicable.*

An author for each chapter would be determined from among the NSF project directors. (Each had already agreed in principle to assist in the preparation of a monograph, if funded.)

The outline, chapter descriptions and selection of authors would be discussed with the NSF Technical Monitor before being finalized.

2. Battelle would coordinate the efforts of the monograph authors, give guidelines for each chapter, discuss the overall approach to presenting information, and otherwise ensure consistency throughout the document.
3. Respective authors would prepare a draft of their chapter and submit it to Battelle. Battelle would prepare the introductory and summary sections of the monograph.
4. Battelle would edit the input and prepare a final draft. This would be reviewed by the NSF Technical Monitor, and revisions would be discussed.
5. Battelle would coordinate the revisions needed with each author.
6. Battelle would prepare the final report and submit copies to NSF.

Information Exchange

Battelle provided copies of its establishment and employee survey forms to the other project directors (See Appendix E). Some of the university based projects utilized items from these questionnaires in developing their own survey instruments. Additionally, Battelle encouraged the other project directors to submit their respective survey forms, for information, to the other group members conducting studies of small, geographically dispersed industry. When asked, Battelle project staff

reviewed and critiqued the survey forms utilized in the university based projects.

Bibliographic information on continuing education was also provided by Battelle (see Appendix F). The other project directors were encouraged to share their bibliographic information with each other and with Battelle. A number of other information requests pertaining to conduct of the studies were received by Battelle and handled, via telephone, on an individual basis.

CONCLUSIONS AND RECOMMENDATIONS

In fulfilling the objectives of the project coordination effort, it became obvious that there were both advantages and disadvantages to the approach being followed. The technical scope of the five individual projects had been approved by NSF prior to initiation of the coordination activity. Each project had objectives and a proposed methodology that were somewhat different from those of the other projects. There were major differences between Battelle's study and those of the four university groups. Namely, the university studies focused on identifying potential "market areas" for their services, whereas Battelle's study had more of a "research" orientation. Also, Battelle's study was national in scope, whereas the university studies were of a local or regional nature. Within the coordination effort, each study was to fulfill its own objectives and to follow the unique study approach outlined on the respective proposals, as approved by NSF.

The advantage of the scenario for coordination described above was that it permitted the individual project directors a high degree of "academic" freedom and may have resulted in more useful market information for the universities involved. The disadvantage of this type of coordination was that it made standardization aimed at comparability of results difficult, despite attempts to standardize terminology and to report results within agreed upon categories.

A further constraint was that Battelle, despite its role as coordinator, had no contractual authority which would have permitted a degree

of technical control over the individual studies. Thus, coordination was completely dependent upon the dedication of the involved parties to the objectives of coordination. However, none of the project directors developed their proposals with the need for ongoing coordination with other, active projects, in mind. Nor did they, in their proposals, incorporate cost estimates for coordination activities.

There are, undoubtedly, many levels of project interaction that could be utilized by NSF in the future. These include:

1. Coordination of issues and definitions
2. Standardization of methodology, and,
3. Technical direction.

Coordination of issues and definitions is the approach that was utilized for the five studies of continuing education in small, dispersed industry.

Standardization of methodology would include factors such as standardized sampling plans, survey instruments, data collection, and analysis. The approach would increase comparability of results but would lessen the adaptability of individual projects to meet local and regional needs. It would be necessary to devote attention to standardization of methodology prior to the solicitation of proposals. Adherence to the selected methodology would be an important factor in the evaluation of proposals to NSF in those subject areas where project interaction was judged to be of importance. Such standardization of methodology could be done, prior to proposal solicitation by NSF or through a "prime contractor" within a particular subject area.

Technical direction is primarily an administrative approach wherein a prime contractor reporting to NSF for a particular subject area would have both technical and cost control over subcontractors performing individual studies in the area. This approach would probably include standardization of methodology, as noted above. It should, if utilized, go beyond mere technical approval of the related projects, to a responsibility for overall program costs. A technical approval function, in itself, could unreasonably escalate the costs of the individual studies, in that the emphasis would be placed on technical accomplishments. If the party responsible for technical direction is also responsible for project costs, greater emphasis would be

placed on a negotiated balance between technical quality and cost.

It is recommended, should the need for close project interaction arise in the future, that NSF utilize either the "standardization of methodology" approach or the "technical direction" approach in lieu of mere coordination of issues and definitions. Either "standardization of methodology" or "technical direction" are likely to result in greater comparability of results.

With respect to the five studies of continuing education for scientists and engineers in small, geographically dispersed industry, it is recommended that NSF provide funding to develop a monograph to synthesize the results of these studies.

APPENDIX A
COORDINATION AGREEMENT

Battelle
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201
Telephone (614) 299-3151
Telex 24-5454

September 13, 1978

Dr. Lyle Phillips
Program Manager for Continuing Education
Division of Science Education Development
and Research
Directorate for Science Education
National Science Foundation
Washington, D.C. 20550

Dear Dr. Phillips:

In reference to our telephone conversation of September 12, 1978, I would be happy to serve as a coordinator for studies to be awarded in the area of continuing education for scientists and engineers employed in small, geographically dispersed plants or companies. It is my understanding that in the role of coordinator I will be responsible for maintaining and promoting communication between the directors of the respective studies. In this capacity, I will endeavor to assure cooperation on issues affecting the general area of continuing education being studied, such as agreement on common definitions and terminology.

As we discussed, some time and travel funds may be required for my coordination activities. Therefore, I will be authorized to incur these expenses as part of a contract award stemming from Battelle's proposal No. 287-J-4208, with the understanding that additional funding for these activities will be available, if necessary. If you have any questions regarding this matter, please feel free to call me at 424-7172. Questions of a contractual nature should be directed to Ms. Gloria Miller at 424-7092.

Lyle, thank you very much for affording us the opportunity to work with you in the area of continuing education. I am looking forward to meeting you and the other study directors in the near future.

Sincerely yours,

Lawrence G. Welling

Lawrence G. Welling
Research Scientist
Center for Improved Education

LGW:llc

APPENDIX B

ESTABLISHMENT OF COORDINATION MEETING

NATIONAL SCIENCE FOUNDATION
WASHINGTON D C 20550

Directorate for Science Education
Division of Science Education
Development and Research

October 13, 1978

Mr. Lawrence G. Welling
Research Scientist
Center for Improved Education
Battelle Columbus Laboratories
505 King Avenue
Colubmus, Ohio 43201

Dear Larry:

Please find enclosed excerpts of the memorandum requesting approval of the special conference for CESE project directors working on regional surveys. It has been whole heartedly approved. We are very anxious to see that the regional continuing education surveys funded this year are coordinated so that we can maximize the resultant information. These surveys represent a serious effort on the part of NSF to get some base data on CESE so that it will be possible to better plan for the future needs of the nation. As you and the other project directors involved know, this is an extremely important and timely task.

We do appreciate your willingness to take on the coordination role as well as the willingness of the other project directors to cooperate in this effort. As I mentioned in our phone conversation, if Battelle could take some pictures of the group and prepare a press release, this would be particularly helpful (as long as it doesn't get in the way of carrying out the proposed activities). If Battelle could make it available to local newspapers, I'll try to get it in the National Press as well as educational publications that would be read by continuing educators. The more people know about this important work, the greater will be its ultimate dissemination and use.

I am enclosing copies of the proposals of the other project directors involved (and doing the same for them).

Again, thanks for your help with the project.

Sincerely yours,

Gene D'Amour
Program Associate
Development in Science Education

Enclosures

cc: Zemp
Amos
Harrell
Adams

Battelle
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201
Telephone (614) 424-6424
Telex 24-5454

October 20, 1978

NSF Project Directors
Continuing Education for
Small or Dispersed Industry

Gentlemen:

This letter is to confirm our meeting on November 21, 1978, to coordinate our respective NSF projects in continuing education for small or dispersed industry. The meeting will be held at Battelle's Columbus Laboratories in Columbus, Ohio. Since this will be a one-day meeting, we should probably plan on convening at 8:30 a.m. If you will be staying overnight, I have included the name and rate information for a motel close to Battelle. Please make your own motel reservations.

It is my understanding that Gene D'Amour of NSF is sending each of us copies of each other's proposals. A review of these proposals prior to our meeting will be helpful.

Regarding an agenda for the meeting, most of you have expressed an interest in discussing definitions, terminology, data collection processes, instrumentation, and sampling plans and procedures. If you have any further ideas or desires regarding the meeting, please let me know. I will attempt to send a copy of a "flexible" agenda to each of you the week preceding our meeting.

Also, it was suggested by Gene D'Amour that a press release of our meeting be prepared since a coordinated effort on our projects could be of significant importance to the area of continuing education for small or dispersed industry. I will have Battelle's Public Relations Department prepare one or more draft press releases prior to our meeting. These will not be released but will be available for your review and amendment/approval at the meeting. At the end of the day, each of us will have a press release covering the project area and the meeting which we can take with us to submit to the newspapers in our communities.

Thank you for your patience and cooperation in helping me schedule this meeting. If you have any questions, please feel free to call me at (614) 424-7172. Since I will not be available from October 26 - November 11,

during this period you may contact Ms. Jean Newborg at (614) 424-7167.

I look forward to meeting you on November 21.

Sincerely,

Larry

Lawrence G. Welling
Principal Psychologist
Training and Human Performance Group
Center for Improved Education

LGW:llc

xc: W. Sam Adams
John M. Amos
Daniel E. Harrell
John W. Zemp
Gene D'Amour

November 14, 1978

NSF Project Directors
Continuing Education for
Small or Dispersed Industry

Gentlemen:

Enclosed is the tentative agenda for the initial coordination meeting of NSF Project Directors. The meeting will be held at Battelle's Columbus Laboratories, 505 King Avenue, Columbus, Ohio, on Tuesday, November 21.

If you have any questions or need any assistance in making hotel arrangements, please feel free to call me at (614)424-7172, or Ms. Jean Newborg at (614)424-7167.

I look forward to meeting with you on November 21.

Sincerely,

Lawrence G. Welling
Principal Psychologist
Training and Human Performance Group

Enclosure

xc: W. Sam Adams
John M. Amos
Daniel E. Harrell
John W. Zemp
Gene D'Amour

TENTATIVE AGENDA

Coordination Meeting of
NSF Project Directors

November 21, 1978
Battelle's Columbus Laboratories

8:30-9:00	Coffee and rolls
9:00-9:15	Discussion of tentative agenda
9:15-10:30	Discussion of definitions and terminology
10:30-11:30 and 1:15-3:15	Discussion of issues and questions specific to each project, including: • data collection procedures • instrumentation • sampling plans and procedures
11:30-1:00	Lunch
1:00-1:15	Group photo
1:15-3:15	Continue discussion of issues and questions
3:15-3:45	Discussion of plan to coordinate continuing education projects
3:45-4:15	Review of press releases

APPENDIX C

TOPICS FOR DISCUSSION

SUGGESTED TOPICS FOR DISCUSSION

1. Data Collection Instruments

   1.1. Data Collection Catagories

      1.1.1. Technical contents of CE programs

      1.1.2. Incentives (motivation) for participation in CE programs

         - Willingness to participate under certain circumstances
         - Extent and type of CE support (financial and/or nonfinancial)

      1.1.3. Personal characteristics

         - Highest degree in S/E field
         - Years since last degree
         - Major field of study
         - Field of work
         - Number of years employed in field of work (number of years employed as S or E)
         - "Working as" occupation
         - Level of technical responsibility
         - Perceived CE needs
         - Age (range)
         - Certification and/or licenses
         - Professional society membership (national, regional, local)
         - Extent to which prerequisites for graduate level courses have been obtained
         - Availability of CE delivery system
         - Type of CE delivery system used in last three years (nature and extent of CE activities)

- Desired type of CE delivery system
- CE needs which cannot be met under existing delivery system
- Objectives of participating in CE
- Factors constraining CE participation
- CE time spent per month
- Perception of individuals degree of obsolescence
- Unmet CE needs

1.1.4. Importance of CE

- CE/productivity interface
- CE/retention interface

1.1.5. Company characteristics

- Number of employees (total)
- Number and occupations of S/E
- Cost of present CE delivery mechanism
- Source of funds for CE
- Methods of determining CE needs
- Existing CE delivery systems
- Desired CE delivery systems
- Unmet CE needs (indicators)
- Extent and type of employee participation
- Specific (unique) problems associated with CE delivery
- Distance to the nearest university offering graduate courses in S/E

1.2. Employer and employee forms

1.2.1. Length

1.2.2. Content

2. Sample Selection

   2.1. Establishments

   2.2. Employees

3. Data Collection

   3.1. Procedures for contacting the sample (personnel director)

   3.2. Pre-test

   3.3. Letters of endorsement

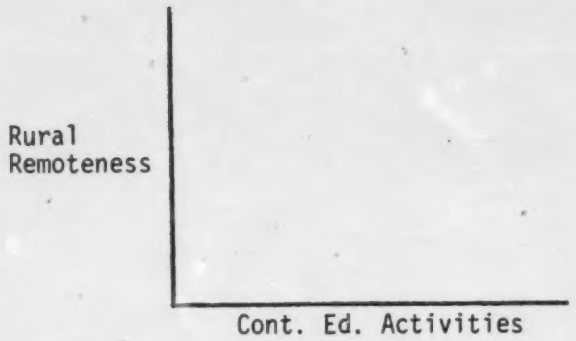
   3.4. Incentives

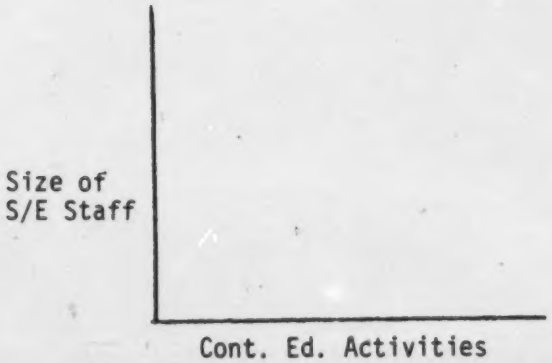
   3.5. Procedures for following up nonrespondents

4. Data Analysis and Reporting the Results

   4.1. Method of comparing of CE for small and/or dispersed industry with large and/or urban industry

   4.2.





APPENDIX D

PRESS RELEASE

Information from

Battelle
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

EDUCATING SCIENTISTS IN SMALL TOWNS: BATTELLE, OTHERS ASSESS PROBLEMS FOR NSF

For Immediate Release

What do scientists and engineers who work in small plants distant from large cities or universities do about continuing education programs?

The National Science Foundation (NSF) hopes to find some of the answers as it begins what may be initial steps in producing a basis for planning and developing improved continuing education services for such groups.

As part of five National Science Foundation studies, researchers will assess--on a national and regional level--the nature and extent of continuing education for scientists and engineers in small, geographically-dispersed plants. Such plants experience problems in meeting the continuing education needs of their employees because they usually employ too few people to make in-house education programs economically feasible and their geographic locations may prohibit employees from attending local colleges.

Researchers met at Battelle's Columbus Laboratories recently to coordinate the studies, which will last up to two years. Discussions centered on plans and procedures for carrying out the programs.

(MORE)

The organizations that will carry out the work for the NSF and the scopes of their projects include:

- Battelle's Columbus Laboratories, which will assess, on a national basis, the extent of continuing education programs for scientists and engineers in small, dispersed plants.
- Charleston (South Carolina) Higher Education Consortium, which will develop and test a model that can assess the continuing education needs of scientists and engineers at the local and regional levels.
- University of Missouri-Rolla, which will determine the continuing education needs of scientists and engineers in rural areas and small communities of the Ozark region in Missouri, Oklahoma, and Arkansas.
- North Carolina State University, which will assess the nature and extent of continuing education programs for scientists and engineers in North Carolina.
- University of Wisconsin-Oshkosh, which will assess the continuing education needs of these groups in north central Wisconsin.

12/1/78

118-78

APPENDIX E
BATTELLE'S SURVEY INSTRUMENTS

May 25, 1979

Re: Continuing Education for Scientists
and Engineers in Small, Dispersed Industry

Gentlemen:

Enclosed are draft copies of Battelle's Establishment Form and Employee Form for our national survey of continuing education for scientists and engineers in small, dispersed industry. In their final format, each questionnaire will be typeset and printed back-to-back. Thus, we hope to be able to reduce the length of each questionnaire to four sheets of paper (or eight pages).

I would appreciate any comments which you may have regarding the draft questionnaires. Please let me have your suggestions via mail or telephone by June 8, 1979.

Sincerely,

Larry

Lawrence G. Welling
Research Psychologist
Center for Improved Education

LGW:llc

xc: Gene D'Amour
John P. Klus
W. Sam Adams
John M. Amos
Daniel E. Harrell
John W. Zemp

NATIONAL SURVEY OF SMALL ESTABLISHMENTS	Battelle Columbus Laboratories 505 King Avenue Columbus, Ohio 43201

ESTABLISHMENT FORM

The information collected on this form will be held in strict confidence and will be used for statistical purposes only. The information will only be released in a form which does not identify information about any particular company. Your cooperation in completing this questionnaire, and/or your response to any particular question is voluntary. However, your cooperation is needed to make the results of this survey as comprehensive and accurate as possible. Please return this questionnaire within 2 weeks. The enclosed return envelope requires no postage. If you have any problems in completing this form, please call Ms. Sandy Newman (614) 424-5646, collect.

cc 1–6
1–cc 7

ENTER THE NUMBER WHICH CORRESPONDS TO YOUR ANSWER IN THE SPACES PROVIDED.

DESCRIPTION OF ESTABLISHMENT

1. WHICH NUMBER BEST CHARACTERIZES YOUR ESTABLISHMENT? . . _____ cc 8
   - (1) Locally owned and operated
   - (2) Headquarters of regional or national firm
   - (3) Branch of regional or national firm
   - (4) Branch of foreign firm
   - (5) Other (specify) _____

2. WHAT IS THE TOTAL NUMBER OF EMPLOYEES (FULL AND PART-TIME) IN YOUR ESTABLISHMENT? (AN ESTABLISHMENT IS DEFINED AS A SINGLE UNIT LOCATED AT A SINGLE LOCATION TOGETHER WITH ALL SUBDIVISIONS ADMINISTRATIVELY DEPENDENT THEREON) . . . . _____ cc 9–12

3. HOW MANY OF THESE EMPLOYEES ARE SCIENTISTS OR ENGINEERS (i.e., CHEMISTS, PHYSICISTS, LIFE SCIENTISTS, SOCIAL SCIENTISTS, MATHEMATICIANS, STATISTICIANS, COMPUTER SCIENTISTS, ALL ENGINEERS, ETC.)? . . . . . _____ cc 13–16

4. HOW DOES YOUR ESTABLISHMENT RANK IN TERMS OF CONTEMPORARY TECHNOLOGY, COMPARED TO YOUR COMPETITORS? . . . . . _____ cc 17

(1) Top 10 percent
(2) Top 25 percent
(3) Middle 50 percent
(4) Bottom 25 percent
(5) Bottom 10 percent
(6) Not applicable, unique product or services

5. IN THE PAST 3 YEARS HAS YOUR ESTABLISHMENT'S TECHNOLOGICAL POSITION, COMPARED TO YOUR COMPETITORS, IMPROVED, WORSENED OR REMAINED ABOUT THE SAME? . . . . . _____ cc 18

(1) Improved
(2) Worsened
(3) Remained about the same

EDUCATIONAL DELIVERY SYSTEMS

6. WHAT IS THE DISTANCE FROM YOUR ESTABLISHMENT TO THE CLOSEST INSTITUTION OF HIGHER EDUCATION THAT HAS OFFERED COURSES IN SCIENCE OR ENGINEERING? . . . . . _____ cc 19

(1) Less than 10 miles
(2) Between 10 and 24 miles
(3) Between 25 and 49 miles
(4) Between 50 and 99 miles
(5) 100 miles or more

7. WOULD YOUR ESTABLISHMENT BE WILLING TO COOPERATE WITH ANOTHER LOCAL ESTABLISHMENT IN THE SUPPORT OF A CONTINUING EDUCATION ACTIVITY? . . . . . _____ cc 20

(1) Yes, already have
(2) Yes, would be willing
(3) No, would not be willing

8. WHICH OF THE FOLLOWING FACILITIES/EQUIPMENT ARE AVAILABLE AND/OR USED IN THE LAST 12 MONTHS AT YOUR ESTABLISHMENT FOR THE SUPPORT OF CONTINUING EDUCATION PROGRAMS? CHECK (√) ALL THAT APPLY.

		Available (1)	Used (2)	
(a)	Classroom/conference facilities	_____	_____	cc 21
(b)	Laboratory facilities available for course connected experiments	_____	_____	
(c)	Closed circuit TV	_____	_____	
(d)	Motion picture projectors	_____	_____	
(e)	35mm slide projector with synchronized sound	_____	_____	
(f)	Audio cassette	_____	_____	
(g)	Videotape/cassette	_____	_____	
(h)	Large screen projection video	_____	_____	
(i)	Computer	_____	_____	
(j)	Computer assisted instruction	_____	_____	
(k)	Conference telephone	_____	_____	
(l)	In-house library facilities	_____	_____	
(m)	Separate quiet areas for self-study	_____	_____	
(n)	None of the above	_____		cc 34

9. PLEASE RATE EACH OF THE FOLLOWING IN TERMS OF THEIR ADEQUACY FOR THE SUPPORT OF CONTINUING EDUCATION ACTIVITIES, USING THE FOLLOWING SCALE:

4 – Very adequate
3 – Adequate
2 – Inadequate
1 – Very inadequate

		Rating	
(a)	Availability of in-house employees qualified to conduct continuing education activities	_____	cc 35
(b)	Local availability of qualified technical instructors who are not employees	_____	
(c)	Adequacy of establishment's financial support for continuing education	_____	
(d)	Motivation of engineering and/or scientific employees to participate in continuing education activities	_____	
(e)	Availability of courses/seminars/workshops/presentations in needed content areas	_____	
(f)	Convenience of the establishment's geographical location for employee participation in continuing education	_____	
(g)	Adequacy of in-house technical library	_____	cc 41

COMPANY SUPPORT OF CONTINUING EDUCATION

10. DOES YOUR COMPANY SUPPORT CONTINUING EDUCATION? CHECK (√) ALL THAT APPLY.

(a) By providing financial or time incentives to individuals to avail themselves of continuing education opportunities . . . . . _____ cc 42

(b) By developing and presenting its own continuing education activities . . . . . _____

(c) By providing support to other organizations to develop or present continuing education activities . . . . . _____ cc 44

If you checked (√) any of the above please answer the remaining questions.

If you did not check any of the above you are finished. The remaining questions pertain to continuing education activities. Since your company does not support any continuing education activities we do not need your answers to the remaining questions. The information that you have provided will assist in determining the extent of continuing education in small industry. Please return this questionnaire in the enclosed envelope. Thank you for your cooperation.

*For all the remaining questions, only activities designed to further **engineering** or **scientific knowledge** should be reported (e.g., management courses are **not** relevant).*

SOURCES USED IN DETERMINING CONTINUING EDUCATION NEEDS

11. WHAT SOURCES DO YOU USE IN DETERMINING IF COMPANY SUPPORTED CONTINUING TECHNICAL EDUCATION ACTIVITIES OR PROGRAMS SHOULD BE PROVIDED? CHECK (√) ALL THAT APPLY.

(a) Personal communication with personnel from other establishments . . . _____ cc 45

(b) Personal communication with professional or technical societies . . . . _____

(c) Personal communication with colleges or universities . . . . . _____

(d) Technical and industry publications or periodicals . . . . . _____

(e) Intuition based on experience . . . . . _____

(f) Supervisor's identification of employee training/education needs . . . . _____

(g) Inquiries from employees . . . . . _____

(h) Publications or brochures from organizations offering continuing education . . . . . _____

(i) Current news or popular magazine topics . . . . . _____ cc 53

REASONS FOR SUPPORTING CONTINUING EDUCATION

12. WHAT DO YOU PERCEIVE TO BE THE REASONS YOUR COMPANY SUPPORTS CONTINUING TECHNICAL EDUCATION? PLEASE RATE EACH OF THE FOLLOWING IN TERMS OF THEIR IMPORTANCE. PLACE ONE RATING IN EACH BLANK, USING THE FOLLOWING SCALE.

5 – Of highest importance
4 – Very important
3 – Moderately important
2 – Slightly important
1 – Not at all important

		Rating	
(a)	Increases employee productivity	_____	cc 54
(b)	Trains employee for special assignments in fields in which personnel are scarce	_____	
(c)	Extends the productive life of employees	_____	
(d)	Retains present employees	_____	
(e)	Attracts new employees	_____	cc 58

EDUCATIONAL EXPENDITURES AND PARTICIPATION

13. ESTIMATE YOUR ESTABLISHMENT'S ANNUAL EXPENDITURE FOR CONTINUING TECHNICAL EDUCATION FOR SCIENTISTS AND ENGINEERS DURING CALENDAR OR FISCAL YEAR 1978. DO NOT INCLUDE SALARIES AND EXPENSES FOR YOUR IN-HOUSE CONTINUING EDUCATION OR TRAINING STAFF. DO NOT INCLUDE EXPENDITURES FOR CAPITAL EQUIPMENT.

(a)	For tuition reimbursement programs	$__ __ __ __ __ __ .	cc 59–64
(b)	For all other activities	$__ __ __ __ __ __ .	cc 65–70
(c)	Total for all activities	$__ __ __ __ __ __ .	cc 71–76

14. APPROXIMATELY HOW MANY OF YOUR SCIENTISTS AND ENGINEERS PARTICIPATED IN COMPANY SUPPORTED CONTINUING TECHNICAL EDUCATION DURING CALENDAR OR FISCAL YEAR 1978? . . . . . __ __ __ __ cc 77–80

TYPE OF SUPPORT

15. FOR DEGREE-RELATED (CREDIT) COLLEGE OR UNIVERSITY COURSES (MINIMUM 30 HOURS), TO WHAT EXTENT DOES YOUR ESTABLISHMENT PROVIDE THE FOLLOWING TYPES OF SUPPORT (ASSUMING ESTABLISHMENT APPROVAL AND REQUIREMENTS FOR SUCCESSFUL COMPLETION ARE MET)? CHECK (√) ONE BLANK IN EACH ROW. Dup cc 1-2-cc 7

	Not Provided (1)	Total Reimbursement (2)	Partial Reimbursement (3)	
(a) Cost of tuition and registration	_____	_____	_____	cc 8
(b) Cost of books and instructional materials	_____	_____	_____	
(c) Travel costs	_____	_____	_____	

	Not Provided (1)	At Full Pay (2)	At Partial Pay (3)	To Be Made Up By Employee (4)	
(d) Release time from job	_____	_____	_____	_____	cc 11

16. FOR EDUCATIONAL ACTIVITIES OTHER THAN DEGREE-RELATED COURSES (NONCREDIT COURSES, WORKSHOPS, SEMINARS, CONFERENCES OF AT LEAST 5 HOURS IN LENGTH), OFFERED AWAY FROM YOUR ESTABLISHMENT, TO WHAT EXTENT DOES YOUR COMPANY PROVIDE THE FOLLOWING TYPES OF SUPPORT (ASSUMING COMPANY APPROVAL AND REQUIREMENTS FOR SUCCESSFUL COMPLETION ARE MET)? CHECK (√) ONE BLANK IN EACH ROW.

	Not Provided (1)	Total Reimbursement (2)	Partial Reimbursement (3)	
(a) Cost of tuition and registration	_____	_____	_____	cc 12
(b) Cost of books and instructional materials	_____	_____	_____	
(c) Local travel costs	_____	_____	_____	
(d) Out of town travel costs	_____	_____	_____	

	Not Provided (1)	At Full Pay (2)	At Partial Pay (3)	To Be Made Up By Employee (4)	
(e) Release time from job	_____	_____	_____	_____	cc 16

17. FOR EDUCATIONAL ACTIVITIES OFFERED AT YOUR ESTABLISHMENT, MUST THE PARTICIPANT MAKE UP TIME SPENT AWAY FROM WORK TO ATTEND THESE ACTIVITIES? ENTER THE NUMBER THAT BEST DESCRIBES YOUR ESTABLISHMENT'S POLICY IN THE BLANK . . . . _____ cc 17

(1) Not applicable – no such activities offered
(2) Not applicable – such activities not offered during work day
(3) Yes – always make up time
(4) Yes – sometimes make up time
(5) No – time not made up

EFFECTIVENESS OF CONTINUING EDUCATION

18. HOW EFFECTIVELY HAVE THE FOLLOWING FORMS OF CONTINUING TECHNICAL EDUCATION MET THE NEEDS OF YOUR COMPANY? PLEASE RATE EACH OF THE FOLLOWING FORMS IN TERMS OF THEIR EFFECTIVENESS. PLACE ONE RATING IN EACH BLANK.

5 – Extremely effective
4 – Very effective
3 – Moderately effective
2 – Slightly effective
1 – Not at all effective
0 – Company does not sponsor this type of activity

Rating

(a) Degree-related (credit courses) – minimum 30 hours . . . . . _____ cc 18
(b) Non-credit courses – minimum 30 hours
  (i) Conducted at your establishment . . . . . _____
  (ii) Conducted away from your establishment . . . . . _____
(c) Educational activities (workshops, seminars, conferences, etc.) – 5–29 hours
  (i) Conducted at your establishment . . . . . _____
  (ii) Conducted away from your establishment . . . . . _____
(d) Organized self-study activities (correspondence courses, programmed instruction, etc.) . . . . . _____
(e) Educational presentation at professional or technical society meetings . . . . . _____
(f) Other (specify) _____
_____
_____ _____ cc 25

EMPLOYEE OBJECTIVES IN PARTICIPATION

19. WHAT DO YOU PERCEIVE TO BE THE PRIMARY OBJECTIVES OF SCIENTIFIC AND ENGINEERING EMPLOYEES WHO PARTICIPATE IN CONTINUING EDUCATION ACTIVITIES? PLEASE RATE EACH OF THE FOLLOWING OBJECTIVES IN TERMS OF THEIR IMPORTANCE TO SCIENTIFIC AND ENGINEERING STAFF. PLACE ONE RATING IN EACH BLANK.

5 – Of highest importance
4 – Very important
3 – Moderately important
2 – Slightly important
1 – Not at all important

		Rating	
(a)	To maintain present position in the company	_____	cc 26
(b)	To attain enhanced or authority position in their field	_____	
(c)	To perform present job assignments better	_____	
(d)	To prepare for increased responsibility	_____	
(e)	To remedy deficiencies in initial training	_____	
(f)	To prepare for new job in same field of specialization	_____	
(g)	To prepare for new job in some other field of specialization	_____	
(h)	To prepare for professional registration or to maintain registration	_____	
(i)	To attain a salary increase	_____	
(j)	To fulfill requirements for promotion	_____	
(k)	To meet expectations or ease pressure from management or supervisor	_____	
(l)	For intellectual stimulation	_____	
(m)	To get to know others within field of work	_____	
(n)	To keep from becoming obsolete	_____	cc 39

cc 40–43
cc 44

THANK YOU FOR YOUR COOPERATION

NATIONAL SURVEY OF SCIENTISTS AND ENGINEERS IN SMALL ESTABLISHMENTS

Battelle
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

EMPLOYEE FORM

ORGANIZATION: _____ CODE: _____ cc 1–7, 1–cc 8

The objective of this national study is to determine the continuing education needs of scientists and engineers employed in small (500 or fewer employees) industries which are geographically dispersed.

The information collected on this form will be held in strict confidence and will be used for statistical purposes only. The information will only be released in a form which does not identify information about any particular person or company. Your cooperation in completing this questionnaire and/or response to any particular question is voluntary. However, your cooperation is needed to make the results of this survey as comprehensive and accurate as possible.

ARE YOU CONSIDERED BY YOUR EMPLOYER TO BE A SCIENTIST OR ENGINEER?_____

IF YES, PLEASE ANSWER THE FOLLOWING QUESTIONS. ENTER THE NUMBER WHICH CORRESPONDS TO YOUR ANSWER IN THE SPACES PROVIDED.

IF NO, YOU NEED NOT ANSWER THE REST OF THE QUESTIONS. PLEASE RETURN THE QUESTIONNAIRE IN THE ENCLOSED PREPAID ENVELOPE TO:

MS. SANDY NEWMAN, CENTER FOR IMPROVED EDUCATION,
BATTELLE'S COLUMBUS LABORATORIES, COLUMBUS, OHIO 43201.

1. HOW OLD ARE YOU? . . . . . _____ cc 9–10

2. WHAT IS THE HIGHEST ENGINEERING OR SCIENTIFIC DEGREE YOU HOLD? . . . . . _____ cc 11

(1) High school diploma or equivalent
(2) Associate or technical degree
(3) Bachelor's degree
(4) Master's degree
(5) Ph.D./Ed.D./M.D.
(6) Other (specify: _____)

3. IN WHAT SUBJECT AREA DID YOU RECEIVE YOUR HIGHEST ENGINEERING OR SCIENTIFIC DEGREE? . . . . . _____ cc 12

(0) Not applicable – no engineering or scientific degree
(1) Physical Sciences
(2) Life Sciences
(3) Social Sciences
(4) Engineering
(5) Mathematics
(6) Information/Library Science
(7) Computer Science
(8) Other (specify: _____)

4. IN WHAT AREA ARE YOU CURRENTLY WORKING? . . . . . _____ cc 13

(1) Physical Sciences
(2) Life Sciences
(3) Social Sciences
(4) Engineering
(5) Mathematics
(6) Information/Library Science
(7) Computer Science
(8) Other (specify: _____)

5. AT WHAT AGE DID YOU ATTAIN YOUR HIGHEST ENGINEERING OR SCIENTIFIC DEGREE? . . . . . _____ cc 14–15

6. DO YOU HOLD PROFESSIONAL REGISTRATION? . . . . . _____ cc 16

(1) Yes, in engineering
(2) Yes, in other field (specify: _____)
(3) No

7. HOW MANY YEARS HAVE YOU BEEN EMPLOYED WITH YOUR PRESENT ORGANIZATION? . . . . . _____ cc 17–18

8. HOW MANY YEARS HAVE YOU BEEN EMPLOYED AS A SCIENTIST OR ENGINEER? . . . . . _____ cc 19–20

9. WHICH ONE CATEGORY BEST DESCRIBES YOUR HIGHEST CURRENT LEVEL OF SUPERVISORY RESPONSIBILITY? . . . . . _____ cc 21

(1) No supervisory responsibility
(2) Supervision of technicians and/or nontechnical personnel
(3) Supervision of engineering and/or scientific personnel
(4) Management of supervisory personnel
(5) Management of a major department, division or program
(6) General management of the company

10. WHICH ONE CATEGORY BEST DESCRIBES YOUR HIGHEST CURRENT LEVEL OF TECHNICAL RESPONSIBILITY? . . . . . _____ cc 22

(1) Perform limited assignments with specific direction under an experienced engineer or scientist
(2) Perform assignments with limited directions, with a general review of work done
(3) Independently perform most work with directions only to general results expected
(4) Independently work in extending known techniques, data, etc.
(5) Technical direction and review of work performed by others

11. WHICH ONE CATEGORY BEST DESCRIBES YOUR SATISFACTION WITH THE CONTENT AND DUTIES OF YOUR PRESENT JOB?. . . . _____ cc 23

(5) Highly satisfied
(4) Satisfied
(3) Neutral
(2) Dissatisfied
(1) Highly dissatisfied

12. HOW MANY ENGINEERING OR SCIENTIFIC JOURNALS OR PERIODICALS IN YOUR FIELD DO YOU REGULARLY READ? . . _____ cc 24

(0) Don't regularly read any
(1) Read one regularly
(2) Read two regularly
(3) Read three or more regularly

13. ARE YOU A MEMBER OF A NATIONAL PROFESSIONAL ASSOCIATION OR TECHNICAL SOCIETY? . . . . . _____ cc 25

(1) Yes
(2) No

14. HAVE YOU ATTENDED A PROFESSIONAL ASSOCIATION MEETING IN THE LAST 12 MONTHS ON THE NATIONAL, REGIONAL OR LOCAL LEVEL? CHECK (√) ALL THAT APPLY.

(a) Attended a national meeting . . . . . _____ cc 26
(b) Attended a regional meeting . . . . . _____
(c) Attended a local meeting . . . . . _____
(d) Have not attended a meeting . . . . . _____ cc 29

15. WITH HOW MANY COLLEAGUES IN OTHER ORGANIZATIONS DO YOU EXCHANGE SCIENTIFIC OR ENGINEERING INFORMATION ON A REGULAR BASIS? . . . . . _____ cc 30

16. INDICATE OR WRITE IN ANY CONTRIBUTIONS TO NEW DESIGNS, DEVELOPMENTS, OR METHODS, OR PROFESSIONAL ACTIVITIES YOU HAVE MADE IN THE LAST 12 MONTHS. CHECK (√) ALL THAT APPLY.

(a) Made a patent disclosure . . . . . _____ cc 31
(b) Submitted a technical paper or report . . . . . _____
(c) Participated as a speaker or panelist at a seminar or workshop . . . _____
(d) Received certification, recertification, or license . . . . . _____
(e) Received an award or other recognition for a suggestion or innovation . . . . . _____
(f) Other (specify _____) . . . . . _____
(g) None . . . . . _____ cc 37

17. WHAT PERCENT OF YOUR TECHNICAL WORK TIME DO YOU ESTIMATE IS SPENT IN:

Work in which you feel you need more and/or different education and training than you have.	cc 38–40
Work well suited to your education and training.	cc 41–43
Work requiring less education and training than you have.	cc 44–46
Your answer to this question should add up to 100%. TOTAL	100%

The following questions are concerned with the types of continuing education you participated in during the last 12 months. In answering these questions, please include only those activities designed to further your engineering or scientific knowledge. Thus, any management or general courses you may have taken are not relevant for this survey. Exclude your previous high school or undergraduate level activities, and any avocational or nonscientific or nonengineering activities.

18. HAVE YOU PARTICIPATED IN ANY CONTINUING EDUCATION ACTIVITIES DESIGNED TO FURTHER YOUR ENGINEERING OR SCIENTIFIC KNOWLEDGE? . . . . . _____ cc 47

(1) Yes, within the last 12 months (Answer all of the remaining questions)
(2) Yes, within the last 3 years, but not within the last 12 months (Go to Question 25)
(3) No, not within the last 3 years (Go to Question 26)

ITEM 19 BELOW IS CONCERNED WITH CONTINUING EDUCATION ACTIVITIES THAT YOU PARTICIPATED IN WITHIN THE LAST 12 MONTHS. PLEASE NOTE THAT A NUMBER IS REQUIRED IN EACH UNSHADED BOX. IF NONE, PLACE A "0" IN EACH APPROPRIATE BOX.

	DEGREE RELATED COURSES (MINIMUM 30 CLASS-ROOM HOURS)	NON-CREDIT COURSES (MINIMUM 30 CLASS-ROOM HOURS)	EDUCATIONAL ACTIVITIES (i.e., WORKSHOPS, SEMINARS, CONFERENCES, ETC.) (5–29 HOURS)	ORGANIZED SELF-STUDY ACTIVITIES: (PROGRAMMED TEXTS, CORRESPONDENCE COURSES, ETC.)	OTHER (SPECIFY): _____ _____ _____	
19. UNDER EACH HEADING, ENTER THE NUMBER OF COMPANY SUPPORTED (FINANCIAL OR RELEASED TIME) ACTIVITIES THAT YOU PARTICIPATED IN AND THAT WERE:						
a. PRESENTED ON SITE						cc 48–57
b. PRESENTED LOCALLY AT ANOTHER LOCATION (SPECIFY PRESENTING ORGANIZATION)						
1. _____						cc 58–67
2. _____						cc 68–77
3. _____						Dup 1–7 2 – cc 8 cc 9–18
c. PRESENTED AT ANOTHER BRANCH OF YOUR COMPANY LOCATED OUT OF TOWN						cc 19–28
d. PRESENTED OUT OF TOWN AT ANOTHER LOCATION (SPECIFY PRESENTING ORGANIZATION)						
1. _____						cc 29–38
2. _____						cc 39–48
3. _____						cc 49–58

20. DID YOU PARTICIPATE IN ANY CONTINUING EDUCATION ACTIVITIES DURING THE LAST 12 MONTHS THAT WERE NOT SUPPORTED BY YOUR COMPANY; THAT IS, ACTIVITIES FOR WHICH YOU DID NOT RECEIVE FINANCIAL SUPPORT OR RELEASED TIME? . . . . . _____ cc 59

(1) Yes
(2) No

21. IF YOUR ANSWER TO 20 WAS YES, WHAT TYPES OF ORGANIZATIONS SPONSORED THESE ACTIVITIES? CHECK (√) ALL THAT APPLY.

(a) College or university . . . . . _____ cc 60

(b) Professional society . . . . . _____

(c) Independent educational organization or business providing educational services (Name: _____) . . . . _____

(d) Other (specify: _____) . . . . _____

(e) Don't know . . . . . _____ cc 64

22. HOW EFFECTIVELY HAVE THE FOLLOWING FORMS OF CONTINUING EDUCATION MET YOUR NEEDS? PLEASE RATE EACH OF THE FOLLOWING FORMS IN TERMS OF THEIR EFFECTIVENESS, USING THE FOLLOWING SCALE:

5 – Extremely effective
4 – Very effective
3 – Moderately effective
2 – Slightly effective
1 – Not at all effective
0 – Never been involved in this type of activity

Rating

(a) Degree-related credit courses – minimum 30 hours . . . . . _____ cc 65

(b) Non-credit courses – minimum 30 hours

(i) Conducted at your establishment . . . . . _____

(ii) Conducted away from your establishment . . . . . _____

(c) Educational activities (workshops, seminars, conferences, etc.) – 5–29 hours

(i) Conducted at your establishment . . . . . _____

(ii) Conducted away from your establishment . . . . . _____

(d) Organized self-study activities (correspondence courses, programmed instruction, etc.) . . . . . _____

(e) Educational presentations at professional or technical society meetings . . . . . _____

(f) Other (specify: _____) . . . . . _____ cc 72

23. APPROXIMATELY HOW MUCH MONEY DID YOU AND YOUR COMPANY SPEND IN THE LAST 12 MONTHS FOR YOUR CONTINUING EDUCATION AND TRAINING? (DO NOT INCLUDE THE COST OF COMPANY TIME) — Dup 1–7, 3 – cc 8

Personal cost . . . . . $_____ — cc 9–12

Company cost . . . . . $_____ — cc 13–16

24. APPROXIMATELY HOW MANY HOURS, BOTH PERSONAL AND COMPANY TIME, DID YOU SPEND IN THE LAST 12 MONTHS FOR YOUR CONTINUING EDUCATION AND TRAINING?

Personal time . . . . . _____ hours — cc 17–19

Company time . . . . . _____ hours — cc 20–22

25. IF YOU HAVE PARTICIPATED IN CONTINUING EDUCATION ACTIVITIES WITHIN THE LAST 3 YEARS, WHAT WERE YOUR OBJECTIVES IN PARTICIPATING? RATE EACH OF THE FOLLOWING OBJECTIVES IN TERMS OF THEIR IMPORTANCE TO YOU, USING THE FOLLOWING SCALE.

5 – of highest importance
4 – very important
3 – moderately important
2 – slightly important
1 – not at all important

		Rating	
(a)	To maintain present position in the company	_____	cc 23
(b)	To attain an enhanced or authority position in my field	_____	
(c)	To perform present job assignments better	_____	
(d)	To prepare for increased responsibility	_____	
(e)	To remedy deficiencies in initial training	_____	
(f)	To prepare for new jobs in same field of specialization	_____	
(g)	To prepare for new job in some other field of specialization	_____	
(h)	To prepare for professional registration or to maintain registration	_____	
(i)	To attain a salary increase	_____	
(j)	To fulfill requirements for promotion	_____	
(k)	To meet expectations or ease pressure from management or supervisor	_____	
(l)	For intellectual stimulation	_____	
(m)	To get to know others within field of work	_____	
(n)	To keep from becoming obsolete	_____	cc 36

26. WHAT DO YOU CONSIDER A REASONABLE DISTANCE IN MILES TO TRAVEL ONE WAY TO PARTICIPATE IN THE FOLLOWING CONTINUING EDUCATION ACTIVITIES?

(a)	One day workshop/seminar/conference with no overnight stay	_____ miles	cc 37–40
(b)	Workshop/seminar/conference of at least one day with at least one overnight stay	_____ miles	cc 41–44
(c)	Once a week for a quarter/semester period	_____ miles	cc 45–47
(d)	Twice a week for a quarter/semester period	_____ miles	cc 48–50
(e)	More than twice a week for a quarter/semester period	_____ miles	cc 51–53

27. IF YOU HAVE NOT PARTICIPATED IN CONTINUING EDUCATIONAL ACTIVITIES WITHIN THE LAST 3 YEARS, CHECK YOUR REASONS FOR NOT PARTICIPATING.

(a)	There is no "payoff" for participating; that is, participation is not related to pay raises, promotion, additional responsibility, etc.	_____	cc 54
(b)	No need, additional knowledge is not necessary for present position	_____	
(c)	The company does not encourage continuing education	_____	
(d)	My immediate supervisor or manager does not encourage continuing education	_____	
(e)	The company's financial support is not sufficient	_____	
(f)	Physical distance from sources of continuing education is prohibitive	_____	
(g)	Needed courses/seminars/workshops are not offered or are not offered when I can attend	_____	
(h)	Other personal commitments are more important to me at this time	_____	
(i)	Not applicable -- just received degree	_____	
(j)	Not applicable – about to retire	_____	
(k)	Other (specify: _____)	_____	cc 64

THANK YOU FOR YOUR COOPERATION

APPENDIX F

BATTELLE'S BIBLIOGRAPHY

Enclosed is a bibliography in the area of continuing education. Some of the literature listed may be of use to you in writing your report to NSF. This list was typed directly from the literature sources. I asked my secretary to include any information which could possibly be of assistance to you in obtaining copies of the books or articles that you may be interested in reviewing. If there is a literature source that you cannot locate from the information provided, please call Ms. Sandy Newman at (614) 424-5646. She will check the information for you and will call you directly or have our secretary contact you. It is my impression, however, that the information presented in the bibliography is generally as extensive as that available to us.

If you are knowledgable of any literature not included on the list which you feel may be of potential use to the other NSF project directors investigating continuing education in small, dispersed industry, I recommend that you share this information with us. Hope that your projects are going well. I will be communicating with you by telephone regarding other coordination activities.

Sincerely,

Lawrence G. Welling
Project Director
Center for Improved Education

LW:ssd

Enc.

cc: Gene D'Amour
W. Sam Adams
John M. Amos
Daniel E. Harrell
John W. Zemp/Monica J. Hamill

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